

effect of even a minute amount of moisture present in the weld zone when hydrogen is added to the shield gases during the first root pass.

Typically, hydrogen is not used with non-stainless steel GTAW welding for reasons well known in the field. The basic Flood patented process, on the other hand, avoided the adverse effects of hydrogen in the weld zone when carbon-based steels were being welded by essentially flushing the hydrogen out of the root pass weld by a subsequent second pass weld over the root pass weld, when only inert gas is provided in the shield gas.

The basic process yielded good quality welds that did not reflect typical weld quality problems associated with hydrogen in the weld zone, so the quality of the weld simply was not an issue with regard to the basic Flood patented process.

The invention arose out of Flood's observation that random violent expulsions of molten metal occurred during second pass welds using inert gas alone such that the welding head and gas lens were damaged, as described on page 2, third paragraph of the specification. Specifically, the eruptions deposited weld metal on the electrodes and the gas lens to the extent that they required repair or replacement before welding could continue. It should be noted that the second pass weld is usually termed a "dry wash" because it involves fusion welding over the first weld without using a filler metal.

The specification describes various attempts by the inventor Flood to solve the problem and a declaration by the inventor Flood under 37 C.F.R. 1.132 is submitted herewith to provide a yet more detailed recitation of the inventor's efforts to solve the metal expulsion problem observed while he was using the basic patented process.

The appended Flood declaration presents factual statements of the inventor describing specific experimental efforts he made to explore the problem of metal expulsion and how he eventually arrived at the solution of using elastomer welding gas hoses having very low moisture permeability coefficients, namely coefficients of 275 or less.

It must be emphasized that the declaration of Flood, while containing certain opinion statements, primarily contains factual statements that should not be dismissed as merely self-serving statements of the inventor. Flood's declaration tells his story underlying the claimed invention and is relevant to the issue of "non-obviousness".

Given that the inventive subject matter recited in the claims under consideration relate to an improvement on a novel basic welding method developed by the inventor with a co-inventor which is the subject of their earlier patent 5,686,002, the inventor is most familiar with all of the parameters related to the basic welding method and would be most familiar with problems encountered in carrying out the method as well as any solutions to such problems that he discovered. The inventor Flood is a person intimately familiar with the entire welding process recited in the claims of this application and it is logical that he is qualified to discuss his knowledge of the state of the art at the time he made his invention.

Most importantly, it is clear from the original disclosure of the patent application as well as the appended Flood declaration that the inventor Flood had no reason to be concerned with the quality of the welds achieved by the basic patented welding method recited in claim 1 and therefore would not have been motivated to solve the metal expulsion problem by investigating factors that could affect the quality of the basic welding method.

The Bhadha article is concerned with weld quality. As observed by Flood in his declaration, Bhadha describes "test welds" resulting when impurities are removed according to his recommendations (column 2 of the Bhadha article). The metal being welded by Bhadha is aluminum and the test weld shows elimination of weld porosity and "significant improvement in ductility, with fewer microcracks, as determined by bending tests."

It is inescapable that Bhadha teaches the avoidance of contaminants such as oxygen and moisture, including such contaminants that could diffuse through the walls of rubber and plastic hoses, for the purpose of avoiding poor weld quality. Nothing in Bhadha remotely suggests that such impurities could cause violent expulsion of weld metal on a second pass over a first root pass in which a hydrogen containing shield gas has been employed. There is nothing within Bhadha connecting the contamination he describes with such weld metal expulsion and there is nothing within Bhadha that would offer any suggestion or motivation to use elastomer gas supply hoses different from those already being used by the inventor which supplied sufficiently uncontaminated gas to produce a good quality weld.

Thus, even if the inventor had the Bhadha article in front of him as he observed the molten metal expulsions, there is nothing within the entire article or the prior art as a whole that would suggest this inventor to try a different gas supply hose, in particular an elastomer hose having a moisture permeability coefficient of 0 to 275. Indeed, the discovery that such elastomer hoses could eliminate the violent metal eruptions is a discovery resulting from painstaking and exhaustive experimentation by Flood in uncharted territory where the existing prior art provided no clues about solving the expulsion problem.

As stated by the inventor in paragraph 17 of his declaration:

Weld quality was not an issue whatsoever in my quest to solve the expulsion problem. No one to my knowledge, including Bhadha, could explain how such phenomena could occur in an otherwise good quality weld meeting all applicable standards for carbon steel butt welds.

In further support of the declaration of Flood, the declaration of William E. Sandford, a former co-worker of Flood, is also submitted herewith under 37 C.F.R. 1.132. Like Mr. Flood, Mr. Sandford is highly experienced in welding and pipe fitting technologies and the factual statements contained in his declaration sustain and confirm the challenges faced by the inventor Flood in overcoming the molten metal expulsion problem.

Mr. Flood consulted with Mr. Sandford while Mr. Sandford was employed by the Assignee of this application as part of Mr. Flood's efforts to seek a probable cause of the metal expulsions and to develop a solution to the problem.

Paragraph 6 of the Sandford declaration is particularly revealing inasmuch as it states that the welding system being used by Flood with the basic patented method was a well proven system capable of producing high quality GTAW welds using 100% inert gas, but the problem of metal expulsion arose when hydrogen was used in the shield gas in the first root pass of the basic patented method.

Mr. Sandford describes his views about possible causes of the random events that were observed, including the possibility of the absorption of hydrogen by the inner wall of the gas tubing followed by outgassing contaminated gas, aspiration leaks, etc. Most importantly, Mr. Sandford states: "The possibility of the need for hoses with lower

gas/water vapor permeability values to allow use of hydrogen in the shield gas was not considered. I was unaware of any information that could definitely explain the exact mechanism for the expulsions, nor any information indicating that low permeability hoses would prevent expulsion."

Notably, Mr. Sandford goes on to explain in paragraph 6 that flexible elastomer hoses are preferred with GTAW weld heads due to their higher flexibility and ultra low permeability hose materials tend not to be as flexible as elastomer hoses with slightly higher permeability values, which, as he states, "probably explains why they have not been adopted in the past."

These statements by Mr. Sandford recite facts within his knowledge and not mere opinions. It is worthwhile to note, on the other hand, that Sandford does express the opinion that: "Mr. Flood in my view had an extraordinary number of variables to investigate in solving the expulsion problem, and his discovery of the up-to-then unknown effect of minute gas or vapor permeation in the elastomer shield gas delivery hoses on second pass welds made over a first pass weld where hydrogen gas is used as a shield gas during a first root pass weld on carbon-based steel using GTAW equipment and his solution to the problem involving the use of elastomer hoses having a very low moisture permeability coefficients less than 275 is novel and was not obvious to me."

It is recognized that the issue of novelty and non-obviousness is a matter for the examiner to determine, nevertheless it is clear from the factual statements contained in the declarations of Flood and Sandford, as well as the disclosure contained in the patent application, all of which are consistent, that the teachings of Bhadha are largely irrelevant with regard to the rejected claims and in particular that there is no motivation, suggestion or teaching in Bhadha to modify the method disclosed in Flood et al. 5,686,002 in the manner suggested by the examiner to achieve the purpose and function of the subject matter recited in the rejected claims.

A declaration of another co-worker of Mr. Flood, namely Michael Porter, is also submitted herewith under 37 C.F.R. 1.132 to confirm and ratify the declaration of the inventor Flood.

In his declaration, Mr. Porter, clearly a person skilled in the welding field, first

reveals that he is the co-inventor named in Flood et al. Patent 5,686,002 and that he consulted with Flood when he first observed the molten metal expulsions.

Mr. Porter acknowledges that the equipment used by Flood in making the welds according to the basic patented method met all standards for shielding and low moisture contamination. He also explains that he was aware of the need to avoid moisture in the weld zone during certain welding procedures, particularly GTAW welding of carbon-based steel, but nevertheless he did not appreciate that a very small amount of moisture that might diffuse through the walls of some elastomer gas delivery hoses (called "outgassing" in the field), could cause the expulsions observed by Mr. Flood. Notably, Mr. Porter advised Mr. Flood that the gas supply hoses could be a candidate for study in view of the fact that outgassing effects with such hoses could affect weld quality under certain circumstances. More significantly, Porter admits that: "the effect of minute amounts of moisture outgassing in elastomer hoses when hydrogen is present in the shield gas during the first root weld pass on carbon-base metal was unknown at the time in the field, in my view, and any such outgassing would not readily explain the violent molten metal expulsions observed by Mr. Flood during a second weld pass over the root pass." (Porter declaration, paragraph 6)

Mr. Porter goes on to observe that the Bhadha article fails to discuss the problem of molten metal expulsion but is concerned with weld quality.

In short, a person skilled in the art intimately familiar with the teachings of Flood et al. '002 having knowledge of the teachings of the Bhadha article, would not be motivated in the least to use a weld gas delivery hose having ultra low moisture permeability coefficients because there is nothing whatsoever within Bhadha suggesting to the skilled person that this would solve a molten metal expulsion problem during a second weld pass over a first root pass where hydrogen containing shield gas was employed while welding non-stainless steel metal work pieces. Indeed, the skilled person would be led to dismiss exploration of ultra low moisture permeability coefficient hoses because other causes of the problem might be more likely, as explained by the inventor Flood in his declaration.

In conclusion, the examiner is correct that the Bhadha article teaches that, as a general principle, it is advantageous to reduce impurities such as moisture in the

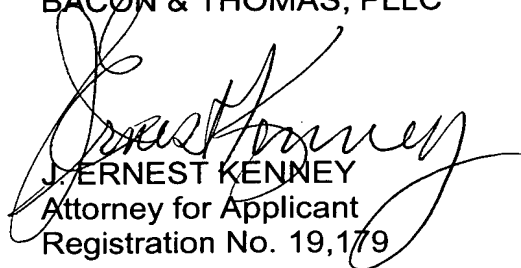
shielding gas system employed with GTAW welding, but the examiner fails to observe that this teaching is directed to the quality of the welds where certain metals are involved, while offering no explicit or implicate suggestion, motivation or teaching of solving a metal expulsion problem that, from all aspects, seems to be unrelated to welding gas delivery hoses under circumstances where the gas delivery hoses are producing good quality welds to begin with.

It is respectfully submitted that the examiner's rejection is founded on improper combination of prior art that essentially "reads into" the prior art the teachings of the claimed invention. As stated by the Court of Appeals for the Federal Circuit in Kahn, 441 F.3d at 988 (Fed. Cir. 2006):

According to the "motivation-suggesting-teaching" test, a court must ask "whether a person of ordinary skill in the art, possessed with the understandings and knowledge reflected in the prior art, and motivated by the general problem facing the inventor, would have been led to make the combination recited in the claims."

It is respectfully submitted that a skilled person would not have been so motivated, and accordingly, it is respectfully submitted that withdrawal of the rejection of claims 1, 3, 4 and 9-17 is warranted and the same is respectfully requested.

Respectfully submitted,  
BACON & THOMAS, PLLC

  
J. ERNEST KENNEY  
Attorney for Applicant  
Registration No. 19,179

**Customer Number 23364**  
BACON & THOMAS, PLLC  
625 Slaters Lane, Fourth Floor  
Alexandria, Virginia 22314  
Telephone: (703) 683-0500  
Facsimile: (703) 683-1080

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